

IN THE CLAIMS:

The text of all pending claims, (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~strike through~~. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered).

Please AMEND the claims and ADD new claim 28 in accordance with the following:

1. (ORIGINAL) A storage controlling apparatus, disposed between a physical device and a host, for controlling an access from said host to said physical device, said storage controlling apparatus comprising:

one or more host interface modules, connected to a plurality of channels of said host through a plurality of paths belonging to the same path group, for controlling an interface with said host;

a management module for generally managing the whole of said apparatus;

said management module comprising:

a reconnection queue for enqueueing information on one or more input/output requests to be reconnected among input/output requests from said channels of said host as control blocks, and managing said enqueued control blocks;

a monitoring means for monitoring the number of said enqueued control blocks in said reconnection queue;

a controlling means, when an I/O process corresponding to one of said one or more control blocks managed in said reconnection queue is resumed, for controlling resumption of said I/O process in either a first system of issuing a reconnection request to each of said paths belonging to the same path group one by one through said host interface module and requesting said host interface module to perform said I/O process using a path first successful in reconnection at the point of time that the reconnection succeeds, or a second system of issuing concurrently or almost concurrently the reconnection request to said plural paths belonging to the same path group through said one or more host interface modules and requesting said host interface module to perform said I/O process using a path which first succeeds in the reconnection; and

a switching means for dynamically switching the system to be executed by said controlling means to either said first system or said second system according to the number of the enqueued control blocks monitored by said monitoring means.

2. (ORIGINAL) The storage controlling apparatus according to claim 1, wherein when the number of the enqueued control blocks monitored by said monitoring means is not larger than a predetermined number, said switching means switches the system to be executed by said controlling means to said first system, and when the number of the enqueued control blocks monitored by said monitoring means exceeds said predetermined number, said switching means switches the system to be executed by said controlling means to said second system.

3. (ORIGINAL) The storage controlling apparatus according to claim 1, wherein said management module further comprises a management table for managing a use status of each of said paths through said one or more host interface modules, and when said first system is executed, said controlling means refers to said management table to issue the reconnection request to paths set free in said management table one by one through said host interface module.

4. (ORIGINAL) The storage controlling apparatus according to claim 2, wherein said management module further comprises a management table for managing a use status of each of said paths through said one or more host interface modules, and when said first system is executed, said controlling means refers to said management table to issue the reconnection request to paths set free in said management table one by one through said host interface module.

5. (ORIGINAL) The storage controlling apparatus according to claim 1, wherein said management module further comprises a management table for managing a use status of each of said paths through said one or more host interface modules, and when said second system is executed, said controlling means refers to said management table to issue the reconnection request concurrently or almost concurrently to two or more paths set free in said management table through said one or more host interface modules.

6. (ORIGINAL) The storage controlling apparatus according to claim 2, wherein said management module further comprises a management table for managing a use status of each of said paths through said one or more host interface modules, and when said second system is executed, said controlling means refers to said management table to issue the reconnection request concurrently or almost concurrently to two or more paths set free in said management table through said one or more host interface modules.

7. (ORIGINAL) The storage controlling apparatus according to claim 3, wherein said management module further comprises a management table for managing a use status of each of said paths through said one or more host interface modules, and when said second system is executed, said controlling means refers to said management table to issue the reconnection request concurrently or almost concurrently to two or more paths set free in said management table through said one or more host interface modules.

8. (ORIGINAL) The storage controlling apparatus according to claim 4, wherein said management module further comprises a management table for managing a use status of each of said paths through said one or more host interface modules, and when said second system is executed, said controlling means refers to said management table to issue the reconnection request concurrently or almost concurrently to two or more paths set free in said management table through said one or more host interface modules.

9. (ORIGINAL) The storage controlling apparatus according to claim 1, wherein when said second system is executed, said controlling means successively requests the second and later paths which succeed in the reconnection to perform the I/O processes corresponding to one or more control blocks which can be reconnected among said control blocks managed in said reconnection queue.

10. (ORIGINAL) A storage apparatus comprising:  
a physical device; and

a storage controlling apparatus disposed between said physical device and a host to control an access from said host to said physical device;

said storage controlling apparatus comprising:

one or more host interface modules, connected to a plurality of channels of said host through a plurality of paths belonging to the same path group, for controlling an interface with said host;

a management module for generally managing the whole of said storage controlling apparatus;

said management module comprising:

a reconnection queue for enqueueing information on one or more input/output requests to be reconnected among input/output requests from said channels of said host as control blocks, and managing said enqueued control blocks;

a monitoring means for monitoring the number of said enqueued control blocks in said reconnection queue;

a controlling means, when an I/O process corresponding to one of said one or more control blocks managed in said reconnection queue is resumed, for controlling resumption of said I/O process in either a first system of issuing a reconnection request to each of said paths belonging to the same path group one by one through said host interface module and requesting said host interface module to perform said I/O process using a path first successful in reconnection at the point of time that the reconnection succeeds, or a second system of issuing concurrently or almost concurrently the reconnection request to said plural paths belonging to the same path group through said one or more host interface modules and requesting said host interface module to perform said I/O process using a path which first succeeds in the reconnection; and

a switching means for dynamically switching the system to be executed by said controlling means to either said first system or said second system according to the number of the enqueued control blocks monitored by said monitoring means.

11. (ORIGINAL) The storage apparatus according to claim 10, wherein when said the number of the enqueued control blocks monitored by said monitoring means is not larger than a predetermined number, said switching means switches the system to be executed by said

controlling means to said first system, and when the number of the enqueued control blocks monitored by said monitoring means exceeds said predetermined number, said switching means switches the system to be executed by said controlling means to said second system.

12. (ORIGINAL) The storage apparatus according to claim 10, wherein said management module further comprises a management table for managing a use status of each of said paths through said one or more host interface modules, and when said first system is executed, said controlling means refers to said management table to issue the reconnection request to paths set free in said management table one by one through said host interface module.

13. (ORIGINAL) The storage apparatus according to claim 11, wherein said management module further comprises a management table for managing a use status of each of said paths through one or more said host interface modules, and when said first system is executed, said controlling means refers to said management table to issue the reconnection request to paths set free in said management table one by one through said host interface module.

14. (ORIGINAL) The storage apparatus according to claim 10, wherein said management module further comprises a management table for managing a use status of each of said paths through said one or more host interface modules, and when said second system is executed, said controlling means refers to said management table to issue the reconnection request concurrently or almost concurrently to two or more paths set free in said management table through said one or more host interface modules.

15. (ORIGINAL) The storage apparatus according to claim 11, wherein said management module further comprises a management table for managing a use status of each of said paths through said one or more host interface modules, and when said second system is executed, said controlling means refers to said management table to issue the reconnection request concurrently or almost concurrently to two or more paths set free in said management table through said one or more host interface modules.

16. (ORIGINAL) The storage apparatus according to claim 12, wherein said management module further comprises a management table for managing a use status of each of said paths through said one or more host interface modules, and when said second system is executed, said controlling means refers to said management table to issue the reconnection request concurrently or almost concurrently to two or more paths set free in said management table through said one or more host interface modules.

17. (ORIGINAL) The storage apparatus according to claim 13, wherein said management module further comprises a management table for managing a use status of each of said paths through said one or more host interface modules, and when said second system is executed, said controlling means refers to said management table to issue the reconnection request concurrently or almost concurrently to two or more paths set free in said management table through said one or more host interface modules.

18. (ORIGINAL) The storage apparatus according to claim 10, wherein when said second system is executed, said controlling means successively requests the second and later paths which succeed in the reconnection to perform the I/O processes corresponding to one or more control blocks which can be reconnected among said control blocks managed in said reconnection queue.

19. (CURRENTLY AMENDED) A reconnection controlling method in a storage apparatus comprising a physical device and a storage controlling apparatus disposed between said physical device and a host to control an access from said host to said physical device, said storage controlling apparatus comprising one or more host interface modules, connected to a plurality of channels of said host through a plurality of paths belonging a same path group, for controlling an interface with said host and a management module managing said storage controlling apparatus, said method comprising the steps of:

enqueueing information on one or more input/output requests to be reconnected among input/output requests from a plurality of channels of said host as control blocks in a reconnection queue, and managing said enqueued control blocks;

monitoring the number of said enqueued control blocks in said reconnection queue; and

resuming an I/O process corresponding to one of said one or more control blocks managed in said reconnection queue by dynamically switching, according to the number of said enqueued control blocks, to either a first system of issuing a reconnection request to each of said paths belonging to the same path group one by one through said host interface module and requesting said host interface module to perform the I/O process using a path first successful in reconnection at the point of time that the reconnection succeeds, or a second system of issuing the reconnection request concurrently or almost concurrently to said paths belonging to the same path group through said host interface module and requesting said host interface module to perform the I/O process using a path which first succeeds in the reconnection.

20. (ORIGINAL) The reconnection controlling method in a storage apparatus according to claim 19, wherein when the number of said enqueued control blocks is not larger than a predetermined number, said first system is switched to, and when the number of said enqueued control blocks exceeds said predetermined number, said second system is switched to.

21. (CURRENTLY AMENDED) The reconnection controlling method in a storage apparatus according to claim 19, wherein said management module manages a use status of each of said paths ~~is managed in using~~ a management table through said host interface module; and

when said first system is executed, the reconnection request is issued to paths set free in said management table one by one.

22. (CURRENTLY AMENDED) The reconnection controlling method in a storage apparatus according to claim 20, wherein said management module manages a use status of each of said paths ~~is managed in using~~ a management table through said host interface module; and

when said first system is executed, the reconnection request is issued to paths set free in said management table one by one.

23. (CURRENTLY AMENDED) The reconnection controlling method in a storage apparatus according to claim 19, wherein said management module manages a use status of each of said paths ~~is managed in~~ using a management table through said host interface module; and

when said second system is executed, the reconnection request is issued concurrently or almost concurrently to two or more paths set free in said management table.

24. (CURRENTLY AMENDED) The reconnection controlling method in a storage apparatus according to claim 20, wherein said management module manages a use status of each of said paths ~~is managed in~~ using a management table through said host interface module; and

when said second system is executed, the reconnection request is issued concurrently or almost concurrently to two or more paths set free in said management table.

25. (CURRENTLY AMENDED) The reconnection controlling method in a storage apparatus according to claim 21, wherein said management module manages a use status of each of said paths ~~is managed in~~ using a management table through said host interface module; and

when said second system is executed, the reconnection request is issued concurrently or almost concurrently to two or more paths set free in said management table.

26. (CURRENTLY AMENDED) The reconnection controlling method in a storage apparatus according to claim 22, wherein said management module manages a use status of each of said paths ~~is managed~~ using in a management table through said host interface module; and

when said second system is executed, the reconnection request is issued concurrently or almost concurrently to two or more paths set free in said management table.

27. (ORIGINAL) The reconnection controlling method in a storage apparatus according to claim 19, wherein when said second system is executed, the second and later



paths which succeed in the reconnection are requested to perform the I/O processes corresponding to one or more control blocks which can be reconnected among said control blocks managed in said reconnection queue.

28. (New) An apparatus controlling an access from a host to a physical device, the apparatus comprising:

a host interface in communication with said host through a plurality of paths belonging to a same path group; and

a controller,

enqueueing information on one or more input/output reconnection requests from among input/output requests from the host as control blocks,

monitoring a number of said enqueued control blocks in said reconnection queue,

when an I/O process corresponding to one of said one or more control blocks in said reconnection queue is resumed, controlling resumption of said I/O process in either a first system of issuing a reconnection request to each of said paths belonging to the same path group one by one through said host interface and requesting said host interface to perform said I/O process using a path first successful in reconnection, or a second system of issuing concurrently or almost concurrently the reconnection request to said plural paths belonging to the same path group through said host interface and requesting said host interface to perform said I/O process using a path first successful in reconnection, and

dynamically switching between said first or said second reconnection system according to the number of the enqueued control blocks.